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BACTERIOLYSIS OF SEWAGE.

The Purification of Sewage and Water. By W. J. Dibdin, F.I.C., F.C.S., &c., late Chemist and Superintending Gas Examiner to the London County Council and the late Metropolitan Board of Works. Pp. xv + 248. Royal 8vo. (London: The Sanitary Publishing Company, Ltd., 1897.)

RECENTLY there has been an astonishing and sudden revival of interest in the question of the action of bacteria on dead organic matter. Pasteur's experiments on the production of disease by morbific germs were so brilliant that, for long, most workers at the subject kept very much in one groove; still there have always been those who, working very quietly, have been accumulating knowledge concerning the action of bacteria on dead material, and the part these organisms play in the process of disintegration of effete matter.

It has, however, long been known that in nature various processes of purification were undoubtedly intimately associated with the life-history of special groups of bacteria. Certain of these organisms, moreover, have been recognised as playing a most important part in bringing organic material into such condition that it may be readily oxidised; and in both France and England investigators have studied this action, especially in connection with the organisms that are associated with the process of nitrification. It is somewhat remarkable that notwithstanding these numerous experiments, and in spite of the fact that the importance of the part which bacteria play in bringing about natural decomposition, nitrification and similar chemical processes had been so early recognised, no systematic attempt on any large scale had until comparatively recently been made to carry out, artificially, what was recognised as being done on a most extensive scale in nature's laboratory. When once, however, a commencement had been made, the course of events was by no means slow, and many investigators soon turned their attention to the question of the disintegration of the organic matter in sewage, its oxidation and "mineralisation." Amongst these later workers, Mr. W. J. Dibdin has taken an important position, and, in connection with his office as chemist to the London County Council, carried on a series of experiments on the bacterial purification of sewage, which in future will certainly be looked upon as constituting one of the most important parts of the pioneer work on the subject that has been carried out in this country. As the outcome of this work, Mr. Dibdin has published in book form a collected series of articles on the purification of sewage and water; and for those who wish to obtain, in clear and concise form, an account of certain of the bacteriological processes involved in this purification, and who wish to have a summary of the chemical changes and results obtained, no better book is at present published. Now that the question is looked upon as of sufficient importance to demand the appointment of a Royal Commission, to assist the Local Government Board to gather information, some such book as that now before us comes very opportunely. It is fortunate, indeed, that the task of supplying such a book has been undertaken by one whose knowledge of the chemical processes involved is of a very wide and practical character, who has a fair knowledge of the essential details of bacteriology, but who, more important still, has had a very wide experience of the actual working of biological filters. The mass of material accumulated in this book does not at first sight appear, as the conclusions are usually so pithily put, and in such simple language, that the enormous amount of work and systematic observation on which they are founded is sometimes almost lost sight of.

In order to convey some idea of the scope of this work, it may be well to give a brief outline of the ground covered by Mr. Dibdin. After a couple of introductory chapters on the "history of putrefaction" and of the attempts that have, from time to time, been made to interfere with the process of putrefaction in sewage and in river-water, and after describing in some detail the various processes of disinfection, deodorisation, precipitation, and ordinary filtration, a short description of the now famous Massachusetts experiments is given. Then follows a very full account of a series of experiments carried out on the purification of London sewage in biological filter-beds at Barking, and the nature and amount of purification brought about in these filter-beds indicated, the measurement of the purification being taken (*a*) from the amount of oxygen absorbed; (*b*) from the amount of albuminoid ammonia got rid of; and (*c*) the increase in the quantity of nitrates. By passing the sewage intermittently through these filters, and by allowing them to rest and become aerated between the charges, it was found that a purification of from 41 to 85 per cent. was obtained; the whole of the organic matter in suspension was completely removed, and an effluent, in most cases fit to be sent into rivers, was obtained. This purification goes on at the rate of about three-quarters of a million gallons per acre of biological filter.

An installation at Sutton was worked on somewhat similar lines, but here the filtrate from one bacteria tank was passed through a second, in which the filtering material was of finer grain; by this means still better results were obtained, 80 per cent. of purification being about the average obtained. The final filtrates were free from all objectionable odour, and remained perfectly sweet on being kept in either open or closed vessels. At both Barking and Sutton the coarse suspended matter was strained out and buried, and the whole of the subsequent changes were supposed to be due to the action of aerobic organisms.

Mr. Dibdin then gives a description of a system which has been worked out by Scott-Moncrieff at Ashstead, and by Cameron at Exeter, who both use an anaerobic chamber in order to initiate an active preliminary breaking-down of the organic matter in the sewage before aerobic organisms are allowed to act upon it. They hold that in this way a more active disintegration of the organic matter is obtained; whilst, in addition, a process of peptonisation is carried on, with the result that a large quantity of the solid material is quickly thrown into solution, in which form it can be

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more readily acted upon by aerobic organisms. It is evident, from the description given and comments made by Mr. Dibdin, that he pins his faith to the aerobic method; though, from the evidence given, it seems probable that the author may in time come to modify his present position.

One of the most interesting sections in the book is that devoted to the description of the various methods by means of which Mr. Dibdin has obtained his results. The description of the micro-filter alone would well repay a perusal of the whole book; the ingenuity exhibited in this simple piece of apparatus marking out Mr. Dibdin as, if not a born, a well-trained experimenter. The methods of determining the amount of nitrates and of oxygen absorbed and dissolved, will appear to the ordinary reader to be considerably less complex and complicated than those usually recommended. This is due, in part, to the fact that some of the processes have undoubtedly been simplified; but it is due still more to the fact that, having worked so much with them, Mr. Dibdin is able to give clear and lucid descriptions of the essential parts of the process without overburdening them with details which, from a practical point of view, are of little importance.

A full description is given of the history of the purification of the Thames from the time that the reaches between Westminster and Waterloo Bridges had their banks covered with accumulations of offensive mud, deposited from water little better than sewage, to the time that fish made their way up the ditches which contained the effluent from the biological filter-tanks at Barking. The whole story is one of engineering, chemistry and bacteriology, set out in plain matter-of-fact form; but Hercules' task of cleansing the Augean stables was mere child's play to the problem that had to be attacked and solved between the years 1855 and 1895. The concluding chapters of the book are taken up with descriptions of some of the methods of ventilation and deodorisation of sewers; with a short account of filtration of potable water; a description of the character of the London water supply; with sections on the action of soft water upon lead; on the application of the biological process to the purification of waste water from private properties, asylums, schools, &c.; and, finally, one on the systematic examination of potable water. Appendices on methods of determining the amount of oxygen dissolved in water, and a detailed report to the London County Council on the experiments on the filtration of sewage effluent during the years 1892–95 complete the work.

Although the reader may not, and probably will not, always agree with Mr. Dibdin, the work on which the conclusions are based appears, in most cases, to be above criticism. The experiments are set out in such form that each one affords ample material on which to base an opinion; the statistics, observations and descriptions are of such a character that not only will they assist in this, but they also give evidence that Mr. Dibdin has made the subject thoroughly his own. His arguments are backed by facts and figures, all the results of careful investigation and of laborious work. The result is that we have a book of far more than ordinary interest, quite apart from the fact that the author has to deal with such interesting matter—a book that may with confidence be recommended to any who take an interest, however slight, in the subject of the bacterial treatment of sewage.

G. S. W.

SCIENCE AND ART OF BUILDING.

Modern Architecture. A book for architects and the public. By H. H. Statham, F.R.I.B.A., Editor of the *Builder*, &c. 8vo, pp. 275. (London: Chapman and Hall, 1897.)

Complete Perspective Course. Britannia Series. By J. Humphrey Spanton. 8vo, pp. 282. (London: Macmillan and Co., 1898.)

Notes on Carpentry and Joinery. By Thomas Jay Evans. 8vo, pp. 396. (London: Chapman and Hall, 1897.)

THE first of these three books suffers from the too prevalent custom of assigning a title to a book that conveys the idea of a greater scope and value than the contents can candidly be said to justify. In the preface the author fairly states the origin of the bulk of the book in a course of lectures delivered to a class of architectural students, not, it is true, previously published, but which, we venture to think, should have appeared in their primary form, possessing all the interest and actuality that such deliverances would have had; without being dressed up with a title that leads the reader to expect a more serious treatment of such an extensive subject as modern architecture.

There are undoubtedly many cultivated people to whom a clear account of modern architecture would be of the greatest interest, inquirers who from time to time, lighting upon some fine modern building, have been puzzled at the qualities which they have felt it to possess, but which are not, at the same time, those of ancient buildings with which the antiquarian leanings of most English people of taste might have made them familiar. Thus made dimly conscious of a new spirit in architecture, they have felt a novel ignorance of the aims and ideals of a modern art, of which very likely they had not been prepared to admit the existence.

A layman is heard to ask an architect, "What style do you call the Imperial Institute?" or "Who was the architect of that fine church of St. Augustine's, Kilburn, which I happened to see the other day?" and so on—questions that show how absolute an ignorance of the development of the architecture of the present day exists even in cultivated circles.

It is to this class, we imagine, that the author intends to appeal as the public mentioned in his title; but the circumstances of the origin of his book in lectures of the kind mentioned above, tells altogether against its usefulness in that respect. It contains a great deal of criticism that was sufficiently useful when directed to the students to whom the lectures were given, but which is out of place in a work addressed to a special class of the public outside.

Again, the author's position as editor of the *Builder* placed at his command a large supply of illustrations for these lectures from the plates of his own journal,

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